formed animals quit the site, and, during the next few days, could be found under logs, and in other suitable places at some considerable distance from it. On the contrary, should a rain in the mean time fill the pond again, and flood over these shallow parts, the transformations were checked; and those with gills and branchiae in all stages of change, once more took to the water. When huddled together in the shallow places, the large and strong ones devoured the smaller and feebler forms; and the different appearance of the two was very striking upon the most superficial examination.

One day in July the whole north half of this pond suddenly ran dry; and I must confess the sight its bottom presented during the following day was one of the most extraordinary, and at the same time most interesting, that I ever beheld, and, after what has been said, can be better imagined than described. It absolutely swarmed with these creatures, whose organizations were accommodating themselves to the new condition of affairs as rapidly as the laws governing the changes permitted. The study would have furnished food for a small volume.

Axolotls are also affected by the character of the ponds or swamps they live in, the same species showing all manner of shades in their coloration. Those in shallow ponds with little or no vegetation, and hard clay bottoms, grow to be very light colored, and long retain their larval forms.

No doubt many such ponds as I have described exist all over this south-western country; and a moment's reflection will make it clear to us how the metamorphosis of this creature tends to save thousands of their lives, when the region is visited by a protracted drought, and their places of water resort fail them. The preservation of the form is thereby, to a great extent, protected.

DR. R. W. SHUFELDT.

Fort Wingate, N. Mex.,
Aug. 12.

THE SONG-NOTES OF THE PERIODICAL CICADA.

THERE are few more interesting subjects of study than the notes of insects and the different mechanisms by which they are produced. They interest every observant entomologist; and it is difficult to record them in musical symbols that can be reproduced on musical instruments, some of the more successful and interesting attempts in this direction having been made by Mr. S. H. Scudder. I have studied closely the notes of a number of species, and have published some of the observations.[1]

In the notes of the true stridulators more particularly, as the common tree-crickets and katydids, I have been impressed with the variation both in the pitch and in the character of the note, dependent on the age of the specimen, and the condition of the atmosphere, whether as to moisture, density, or temperature. Yet, with similarity in these conditions, the note of the same species will be constant and easily recognizable.

A few remarks upon Cicada septendecim will doubtless prove of interest now that the species has been occupying so much attention. I do not find that the notes have been anywhere very carefully described in detail, nor would I pretend to put them to musical scale. Writing seventeen years ago, I described the notes in a general way, as follows: —

"The general noise, on approaching the infested woods, is a compromise between that of a distant threshing-machine and a distant frog-pond. That which they make when disturbed mimics a nest of young snakes or young birds under similar circumstances, — a sort of scream. They can also produce a chirp somewhat like that of a cricket, and a very loud, shrill screech, prolonged for fifteen or twenty seconds, and gradually increasing in force, and then decreasing."[1]

There are three prevalent notes, which, in their blending, go to make the general noise as described above. These are, —

First, That ordinarily known as the *phar-r-r-r-aoh* note. This is the note most often heard during the early maturity of the male, and especially from isolated males or from limited numbers. It is variable in pitch and volume, according to the conditions just mentioned as generally affecting insect melodists. Its duration averages from two to three seconds; and the *aoh* termination is a rather mournful lowering of the general pitch, and is also somewhat variable in pitch, distinctness, and duration. In a very clear atmosphere, and at certain distances, an individual note has often recalled that made at a distance by the whistling of a rapid train passing under a short tunnel. But when heard in sufficient proximity, the rolling nature of the note will undoubtedly remind most persons more of the croaking of certain frogs than of any thing else. I have heard it so soft and low, and so void of the *aoh* termination, that it was the counterpart of that made by Oecanthus latipennis Riley late in autumn, and when shortened from age and debility of the stridulator.

Second, The loudest note, and the one which is undoubtedly most identified with the species in the popular mind, is what may be called the 'screech.' This is the note described by Fitch as "represented by the letters *tsh-e-e-E-E-E-E-E-e-ou*, uttered continuously, and prolonged to a quarter or half a minute in length, the middle of the note being deafeningly shrill, loud and piercing to the ear, and its termination gradually lowered till the sound

[1] 3d rep. ins. Mo., 14, 153, 154; 4th do., 139; 6th do., 150-169.

[1] 1st rep. ins. Mo., 24.

expires." Dr. Fitch errs as to the length of its duration; and I have also erred in the same direction — unless, indeed, there is a still greater range than my subsequent observations would indicate.[1] It is more probable, however, that our memories were at fault; for, as I have verified this year, this shrilling ordinarily lasts from two to three seconds, though occasionally longer, and is repeated at intervals of every five seconds. This note is rarely made by solitary males, or when but few are gathered together: but it is the prevailing note in the height of the season, and is made in unison; i.e., the assembled males on a given tree, or within a given grove, are prompted to it simultaneously, so that its intensity becomes almost deafening at times. It is of the same nature as that made by the dog-day Cicada (Cicada pruinosa Say), and in its higher and louder soundings is not unlike the shrilling of that species, though by no means so sharp and continuous. It is what in the distance gives the threshing-machine sound, and it has often recalled what I have heard in a saw-mill when a log is being cut crosswise by a circular saw.

Third, There is what may be called the intermittent, chirping sound, which consists of a series of from fifteen to thirty, but usually about twenty-two, sharp notes, sometimes double, lasting in the aggregate about five seconds. This sound is so much like that ordinarily produced by the barn or chimney swallow (Hirundo erythrogaster), that a description of the one would answer fairly well for both. It resembles also, though clearer and of higher pitch, the note of Microcentrum retinerve Burm., which I have likened to the slow turning of a child's wooden rattle highly pitched. The above notes, so far as I have recognized them, are of higher pitch, but of less volume, in the smaller, Cassinii, form.

The other notes — viz., that made when the insect is disturbed, and a not infrequent short cry, that may be likened to that of a chick — are comparatively unimportant: but no one could do justice to the notes of this insect without embracing the three peculiar sounds which I have attempted to describe above, and which are commingled in the woods where the species is at all common; though the undulatory screech is by far the most intense, and most likely to be remembered.

C. V. RILEY.

[1] Since this was written, I have heard, on two occasions, this note prolonged to twenty seconds; but this is quite abnormal, and I have no other evidence than the season (June 20) to prove that it came from C. septendecim.

LOST RIVERS.

THE phenomenon of a stream flowing merrily down from a mountain and then disappearing, is, in the west, a very common one. In following down the Rio Grande on an enlarged map, we find many streams entering into it in its upper course. In going down a little farther, reaching the San Luis valley, they are found to suddenly give out on the northern side; and, a few miles farther down, on the southern side also. The principal streams of the valley, the Rio Grande excepted, come in full force down the mountain, flow freely on, and terminate in a marsh, or a small lake, or in the sand. The beds of those which should empty into the Rio Grande are there, but there is no water in them. Similar streams are common over the south-west; and the various streams show all the different stages, from those which really go somewhere all the time, to those which empty into their main stream a part of the time, and those which, alive and full of water above, always fail to reach the stream to which they are headed below.

One time I had the curiosity to examine a stream at the point where it was lost. It was the Rio Hondo, just south of Santa Fé. We had crossed it lower down; and, though the ravine was seventy-five or a hundred feet deep, we had found it perfectly dry. We followed up its south bank for a mile or two until we struck the foot-hills, and there we found it a bright, rippling stream, leaping down from ledge to ledge, very picturesque, with some scattered trees along the banks, and so broad that it was not easy to pass over it, leaping from stone to stone, and remain dry-shod. From here my friend drove back to the crossing, and I walked down to see where and how a stream could lose itself with such a volume of water, and a path well marked out for it. As I followed it down, it ran on merrily in the midst of a little valley not more than six or eight rods wide, along which were pretty meadows alternating with clumps of bushes. It passed through the various incidents of a stream, — here a little fall, there a rapid over thickly set stones, a little farther on a pool. There seemed to be nothing unusual in it, when suddenly I noticed that the little valley widened to double its previous width, the bed became more sandy, and the stream was spread over a greater space. It was evidently going under; and, within twenty rods of where I noticed the first change, the running water had entirely disappeared. The bed of the stream was damp